SCIENCE NEWS-LETTER

The Weekly Summary of Current Science

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A POMPEIAN COOKING STOVE

At a Home in The Street of Abundance

(See page 185)

Vol. XVIII No. 493

The Poison in Your Anti-Freeze

Chemistry—Public Health

Cheaper Production Promises More Wood Alcohol

WILL PEOPLE get chronic or acute poisoning if wood alcohol is used generally as an anti-freeze mixture for automobile radiators? This is one of the questions which government scientists are trying to solve as a result of the proposal to introduce synthetic methanol as an anti-freeze next winter.

Methanol, as wood alcohol is called by chemists, used to be made by distillation of wood. This made its cost high. By the new method, it is made by combining the deadly carbon monoxide with hydrogen, the raw materials being coal and water. This makes synthetic methanol very much cheaper than the product obtained by distillation. Whether it can be used safely in automobile radiators has yet to be determined.

When swallowed, wood alcohol is a poison which may cause blindness and death. Careless bootleggers have mistaken wood alcohol for the less deadly ethyl alcohol, with disastrous results to their clients. This use of the new anti-freeze is to be guarded against by giving it a distinctive color, it is planned.

However, the question remains whether the fumes could not get into the body either by absorption through the skin or by inhalation through nose and mouth, and thus cause disease and possible death. How much of the substance can get into the body in these ways, and how much will cause poisoning, either chronic or acute, must be determined.

Safety Regulations

It may be that the new anti-freeze can be used safely if certain regulations are followed and certain precautions taken, as in the case of the anti-knock gasolines. These contain a small amount of tetra-ethyl lead. When they were first introduced there was question as to whether people generally would be in danger of lead poisoning from the exhaust, and whether men selling it and working in garages where it was sold were risking their health. Cases of lead poisoning in the plants where the anti-knock mixture was made heightened the public anxiety. But scientists found that the only real danger was in the manufacturing plants and that even there, as in other lead industries, certain health precautions, if followed, would safeguard the workers.

A possibility exists of certain people being more susceptible to methanol poisoning than others, and of certain people having the kind of skins that would absorb more of it than others. This also will be investigated, said Dr. R. R. Sayers of the U. S. Public Health Service, who is in charge of the investigation. Chemists of the U. S. Bureau of Mines at Pittsburgh will make chemical and laboratory tests, working with animals. The U. S. Public Health Service is making field tests on men who are now exposed to synthetic methanol.

Ethyl alcohol, closely related to methanol which is methyl alcohol, is largely used at present as an anti-freeze in automobile radiators. Its chief disadvantage is that it evaporates quickly and must be constantly replaced. It is not poisonous like methanol, because man can develop a tolerance to it. Another popular anti-freeze is ethylene glycol, which is made synthetically from petroleum and has the advantages of both ethyl alcohol and of glycerine, also widely used as an anti-freeze. Ethylene glycol and glycerine are more expensive than ethyl alcohol, which in turn costs more than synthetic methanol. The latter is being made by three large companies who make over six million gallons a year.

Science News-Letter, September 20, 1930

The Answer Is

In This Issue

Are *you* apt to be poisoned next winter by *wood alcohol* used as an anti-freeze mixture for automobile radiators? p. 178—How does *Dr. Dirac,* a prominent young British physicist, define the *proton?* p. 179—Where did *tobacco* come from? p. 180—Is it possible to discover a chemical *difference* between *Gentile* and *Jewish* blood? p. 180—How has "the *purest rubber* yet produced" been built up *in the laboratory?* p. 181—If you eat *sugar abundantly,* can you keep your teeth from decaying? p. 181—Why is it so hard to make a successful *vertically rising aircraft?* p. 182—What was recently honored for being the *mother of more than a million* offspring? p. 184.

Bird Suicides

GERMAN and Dutch lighthouses have taken out insurance againt suicide by migratory birds. In the past, birds have dashed against the lenses over the lanterns, dashing themselves to death. The great light at Heligoland, situated right in one of the main migration paths, was an especialy bad offender. Finally, Dr. Weigold, who was for many years head of the ornithology station there, installed a ring of lights around the outside of the tower, to illuminate its ramparts, railings and cupola. This gave the birds some landmarks other than the blazing eye of the light itself, and enabled them to find perches on which to rest.

The system has been installed on other German lighthouses, as well as in Holland, and everywhere the results have been satisfactory.

Ornithology

Science News-Letter, September 20, 1930

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DR. P. A. M. DIRAC

Material Objects Seen As Holes in Space By British Scientist

Physics

A NEW idea of the constitution of space was presented science when Dr. P. A. M. Dirac, twenty-five year old Cambridge physicist already famous in mathematical circles, announced to the British Association for the Advancement of Science at its recent meeting in Bristol his new theory that there is everywhere an infinite density of negative energy electrons.

Gone is the idea that there is absolutely nothing in a perfect vacuum, for Dr. Dirac said: "A perfect vacuum is now to be considered as a region of space in which all the states of negative energy and none of those of positive energy are occupied."

Everything that is material to us, all the material things of the universe, are made up of "holes" in this vast space sea of negative energy, according to Dr. Dirac's theory. In other words, things that actually exist and can be experimented with have positive energy and can be considered to be vacant places in the space of minus or negative energy. In a way, this is a modern substitute for the other.

Defines Proton

Dr. Dirac told the physicists what they have long wished to know, just what is the nucleus of the hydrogen atom, better known as the proton. He said: "It will be a sort of hole in the distribution of negative energy electrons. To make the hole disappear which we can do by filling it up with an electron of negative energy, we must put into it a negative amount of energy. This means that the hole itself will have a positive energy. It now appears reasonable to interpret this hole as a proton."

The importance of this conception is evident from the fact that science now conceives of all chemical elements being made up of protons and electrons, the simplest of elements being hydrogen consisting of one proton and one electron.

"There are theoretical reasons for believing in a connection between the two kinds of particles, electrons and protons," Dr. Dirac explained. "They are not independent and there is ultimately only one kind of fundamental particle in nature. This connection is in fact rather forced upon us by general considerations about the symmetry between positive and negative charge which prevents us from building up a theory of negatively charged electrons without bringing in also the positively charged protons."

Electron Annihilation

The ordinary electron of positive charge is the fundamental unit of electricity and plays a vital role in every electrical device such as a radio tube. When a hole in Dirac's space of negative energy electrons is filled there must be the disappearance of an ordinary electron.

"This disappearance of a hole would thus be interpreted," Dr. Dirac stated, "as an electron and a proton annihilating one another, their energy being emitted in the form of electromagnetic radiation. There appears to be no reason why such processes should not actually occur somewhere in the world. They would be consistent with all the general laws of nature, in particular with the law of conservation of electric charge. The frequency of occurrence of such processes must, however, be very small under ordinary conditions as those processes have never been observed in the laboratory."

World Hunger and Science

Hunger ever threatening the overpopulated world like a spectre and ever pushed back by the hand of science was the center of the dramatic picture drawn by Prof. F. C. Bower, president of the Association, at the opening of its meeting.

He quoted the prophecy of Sir William Crookes made upon the occasion of the British Association's last Bristol meeting in 1898. This eminent scientist then predicted: "Wheat cannot long retain its dominant position among the foodstuffs of the civilized world. Should all the wheat growing countries add to their area to the utmost capacity, on the most careful calculation the yield would give us only just enough to supply the increase of population among the bread-eaters till the year 1931. The details of the impeding catastrophe no one can predict, but its general direction is obvious enough."

But Sir William speaking in 1898 added the comforting prediction that the future would take care of itself because with the artificial production of nitrates the yield of wheat per acre would increase.

"We who are living within a few months of the fateful year of 1931 are unaware of any wheat shortage," Prof. Bower commented. "Sir William Crookes' forecast of 1898 as to the advance in the production of combined nitrogen has been fully realized. Artificial fertilizers are not in view only, but at hand and in mass. Moreover the northern limit of successful wheat culture has been greatly extended by the production of

new strains with ever shortening period between sowing and reaping while the establishment of new varieties is extending the productive area into regions where the rainfall is of short duration and restricted in amount.

"What better example than this could we desire, not only of the importance of applied botany, but as showing also how its advance follows on research independently pursued. For the production of synthetic nitrogen, which has now become a commercial proposition, and the improvement of the strains of wheat by selective breeding along Mendelian lines, are both involved in this crucial question of food supply. And both owe their origin to advance in pure science."

Origin of Tobacco

To millions of smokers throughout the world who puff allegiance to tobacco, Prof. T. H. Goodspeed, American botanist at the University of California, brought news. He announced that he has discovered the origin of tobacco.

The tobacco of commerce is a natural hybrid of two other closely related species that grow wild. Prof. Goodspeed arrived at this conclusion as a result of breeding experiments upon wild tobaccos. He produced a hybrid tobacco that resembles the commercial tobacco externally and in cellular details and he therefore concludes that nature by a similar process many years ago accomplished the same hybridization.

Next of Kin

The chimpanzee was declared to be man's nearest living relative in the course of a discussion by Dr. C. Tate Regan, director of the Natural History Museum of South Kensington, London, who outlined for the British Association the evolution of the primates, among them man.

But the chimpanzee is not in man's direct ancestral line, Dr. Regan made clear. Some anthropologists have heretofore concluded that the gorilla is man's nearest living cousin.

Dr. Regan expressed disagreement with the head of another great natural history museum across the Atlantic, Dr. Henry Fairfield Osborn, president of the American Museum of Natural History of New York City. He attacked Dr. Osborn's view on man's ancestry. Dr. Osborn at the meeting of the American Association for the Advancement of Science last winter surprised his colleagues by contending that the human race has existed as a distinct natural division, wholly separate from its nearest relatives, the great apes, formore than a million years. This made man much older than other anthropologists were willing to concede. Now Dr. Regan reaffirms the more general view that man, while not directly descended from the great apes, is an offshoot from a common stock that divided at a more recent geological period than Dr. Osborn would agree to.

Science News-Letter, September 20, 1930

Gentile and Jewish Blood Unlike

Ethnology

A STRIKING difference between Gentile and Jewish blood when tested with various chemicals was discovered recently by a Russian biologist, Dr. E. O. Manoiloff, creating considerable stir among biologists and anthropologists.

Dr. Manoiloff worked on Jews and Gentile Russians. He added to a blood clot a goodly amount of salt solution and a few drops of a dyestuff, called cresyl-violet. In Jewish blood the color of the cresyl-violet disappeared entirely or almost so, and a bluish or greenish tinge alone remained, while in the Gentile Russian blood the cresyl-violet remained partly insoluble and appeared blue-red. The Jewish blood oxidized the dye more readily than the Russian.

Dr. Manoiloff requested several investigators to send him samples of Jewish and Russian blood marked only with numbers, the identity of the samples being known only to the sender. He tested 202 samples and gave the correct answer in 187 cases, that is 91.7 per cent.

Madame Poliakowa working in the State Institute of the Public Health Commissariat at Leningrad, applied Manoiloff's race-test to the determination of paternity. In cases of pure marriages where father and mother belonged to the same nationality the child's blood reaction corresponded to that of the parents. In mixed marmiages the color of the child's blood resembled either the father's or the mother's. Mixed marriages between Russians on the one hand, Germans, Poles and Finns on the other, made the child's blood look Russian, whereas a match between a Russian and a Jew resulted in Jewish blooded babies.

She concluded that in racially pure marriages the child's blood has the same reaction as the father's and mother's; that if the child's and mother's blood give a different reaction, the father does not belong to the mother's nationality; and finally that if the child has a distinct race reaction which does not correspond to the mother's nationality, the father may belong to the nationality, the reaction of which has been found in the child.

Science News-Letter, September 20, 1930

Bold Invasion

THE root bacteria of clover, alfalfa and other legumes, that befriend the plants and through them man and his domestic animals, come at the outset as though they were enemies. They invade the delicate, thin-walled root-hairs in just about the same way as disease germs, and cause them to curl up as though they were sick. These are among the things that were seen by an international research team, consisting of Dr. H. G. Thornton of the Rothamsted Experimental Station, England, and Dr. E. F. McCoy of the University of Wisconsin, and described by them before the International Botanical Congress at Cambridge.

Not all the roots of a susceptible plant can be invaded by the bacteria, the two investigators found. Alfalfa seedlings were suspended with their roots in a thick "soup" of nodule bacteria; yet only about four per cent. of the root-hairs received bacterial guests.

Moreover, the plants seemed to have a considerable degree of resistnace to such invasion during their infancy, for no bacteria found their way through the walls of the root-hairs until the seedlings had put forth their first true leaves. This would seem to indicate that a secretion of the roots was active, either in discouraging the bacteria before the leaves appeared, or in encouraging them when the proper time arrived.

Botany

Science News-Letter, September 20, 1930

The Roman orator Cicero was aided in his work by a secretary who worked out a shorthand system and took down Cicero's speeches.

Rubber Crystals Are Produced

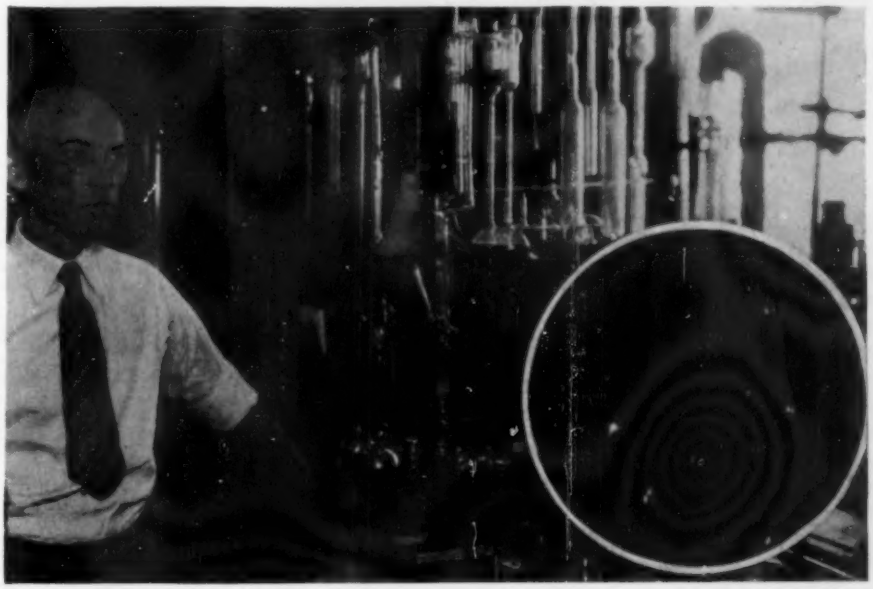
Chemistry

Feat Brings Chemists Nearer Goal of Synthetic Rubber

CRYSTALS of rubber, an important step toward the discovery of this familiar material's composition, have been produced in the chemical laboratories of the U. S. Bureau of Standards in Washington.

In achieving this result it was necessary for Dr. W. H. Smith, chemist, to make the purest rubber yet produced. A long process of purification gave a block of rubber as transparent and colorless as window glass. This material, dissolved in ether, and cooled to 80 degrees below zero Centigrade formed minute crystals of rubber, plainly visible under a magnifying glass.

Dr. Smith even succeded in photographing at this low temperature the fine crystals of rubber and he expects in the near future to publish a scientific report on his work.



Dr. W. H. Smith, of the U. S. Bureau of Standards; the apparatus with which he made crystals of rubber from rubber dissolved in ether at 80 degrees Centigrade; and the crystals themselves, magnification 70 diameters.

Once a small quantity of the crystals is isolated, the chemical composition can be determined by burning them and otherwise analyzing them. This should give the true formula of rubber, which the best estimates indicate may have the molecular composition of some multiple of five carbon atoms and eight hydrogen atoms.

When the structure and composition of rubber is definitely known there will be much greater hope of its synthesis from common sources of carbon and hydrogen, such as coal. The researches just made at the U. S. Bureau of Standards may therefore in the distant future lead to the freedom of the United States from the dominance of foreign grown rubber, but for the immediate future chemical methods of production are not expected to compete with the natural product.

Rubber was distilled for the first time in history when Dr. Smith took some of the pure, colorless rubber and by placing it in a vacuum at 100 degrees Centigrade temperature succeeded in making it evaporate from one side of a flask and solidify on the other side.

The researches were carried out in the division of chemistry, of which Dr. E. W. Washburn is chief, and they were announced by Dr. G. K. Burgess, director of the Bureau of Standards.

Science News-Letter, September 20, 1930

Sugar Can Prevent Tooth Preservation

Medicine

TOOTH-DECAY cannot be averted by the regular use of antiseptic mouth-washes and tooth-pastes, if you continue to eat too much sugar. This is the conclusion of Dr. Russell W. Bunting, professor of dental histology and pathology at the University of Michigan, based on crucial experiments carried out on many school children.

Dr. Bunting and his associates selected three groups of children. To one group they prescribed an antiseptic mouth-wash twice daily without putting them on a special diet, and to the two other groups they prescribed in addition to the mouth-wash a well-balaced diet, in which sugar was eliminated except in cooking to make foods palatable. These children had no sugar on cereals, in beverages, very little sweetened preserves and pastry, and little or no candy.

The results of these experiments, which lasted for nine months, were striking. Two-thirds of the children who used the mouth-wash only developed extensive dental caries, whereas in the children kept on a relatively sugar-free diet, not a single vestige of active caries appeared during the year, and cavities already present did not increase in size.

Dr. Bunting's experiments constitute the first successful attempt to eliminate tooth-decay in a large group of children. They show that little or nothing can be accomplished by pastes or mouth-washes without proper diet.

The importance of diet in the hygiene of teeth is further demonstrated by recent experiments of Mrs. May Mellanby of London. She has shown that puppies developed extremely poor teeth if Vitamin D, the rickets-preventing vitamin, was excluded from the diet. But since typical caries does not occur in dogs, the relation between Vitamin D and this disease can only be determined in man. Experiments dealing with vitamins as possible causes of human tooth-decay are now being carried out by Mrs. Mellanby.

Science News-Letter, September 20, 1930

Man's Efforts to Fly Straight Up

Aviation

Ever since the time of that versatile Italian, Leonardo da Vinci, many strange craft have been planned and made by inventors bent on becoming complete masters of the atmosphere. Success has been elusive, but the persistent are still building. Here is the story of the efforts of five centuries.

SCIENTISTS and inventors have always had the flight of birds to give them encouragement in developing the airplane. But those who have tried to make a heavier-than-air flying machine that would rise straight up and remain stationary in the air have gotten no encouragement from birds. For there is no bird that can fly vertically and only one that can stay still in mid-air. It is the humming bird.

Even without an analogy in nature to encourage them, inventors of helicopters, who have been at work as long as those who flew airplanes a quarter of a century ago, seem nearer their goal than ever before. The latest helicopter, as vertically rising aircraft are known among technical men, is being tested. It is the combined product of the ingenuity of a 27-year-old inventor and the research organization of a $70,000,000 aviation corporation.

This newest helicopter is very much unlike any individual machine of the past. It seems to have taken points from numbers of older helicopters: and its makers should know before long whether these points have been wisely chosen, and also whether new features are correctly designed. Its builders, the Curtiss-Wright Corporation, make no fantastic predictions. They call it "a step toward controlled vertical ascent and descent."

What a helicopter must do has been well defined by the makers of the new machine. "The true helicopter," they say, "is a flying machine that will be able to lift itself vertically off the ground, to hover indefinitely over a given spot, to descend vertically under its own power, and to achieve safe descent in the event of engine failure. In addition, it must be able to move horizontally at satisfactory speed and to be controllable and satisfactorily stable under all flight conditions."

A lot of performance is packed in those two sentences, and engineers have not yet made a machine that will do everything specified. They are, however, learning daily more about the aerodynamic laws the new craft must obey, and how to design helicopters so that least effort will be expended in making these laws work for them.

The first helicopter was a product of the brain of the versatile Leonardo da Vinci. Its aerodynamic principles were carefully thought out and a sketch, which is still in existence, was made of the proposed craft before the inventor's death in 1519. The need of an engine for flying had already been discussed by Roger Bacon as far back as 1250.

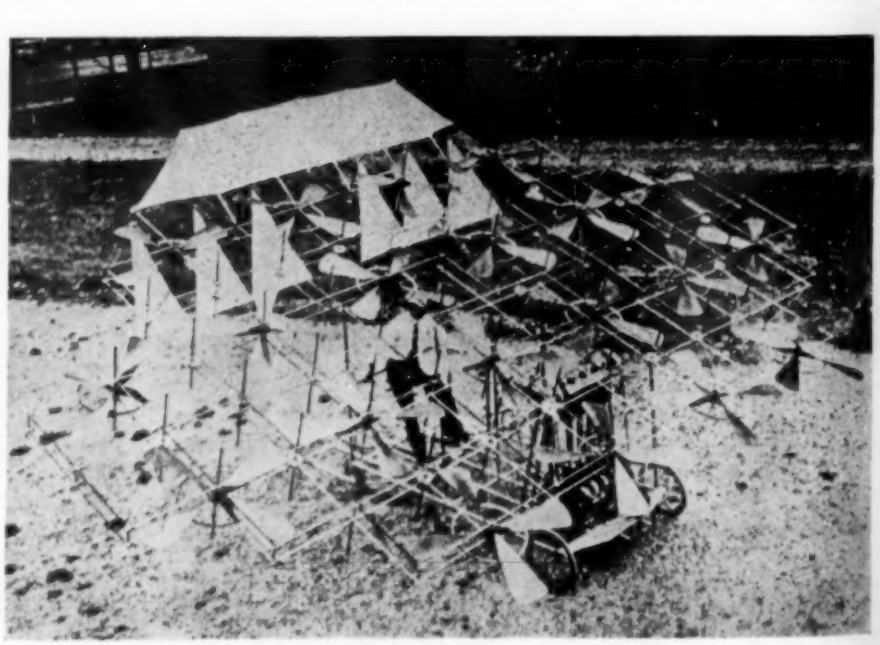
Early Models

By 1843 helicopter design was well in the model-making stage. Encouraged by the new steam engine, inventors were trying to use it as a power plant for aircraft. Sir George Cayley made a model which shows appreciation for the same aerodynamic principles present-day inventors are finding they must follow. He used two lifting propellers or airscrews which turned in opposite directions to provide stability, and smaller airscrews to drive the craft horizontally.

This was just one of the many helicopters that have been designed, modeled or actually built.

To invent helicopters that would not fly successfully seems to have been a weakness, even of great men of science. Thomas A. Edison has long been a believer in this form of craft as the best means of air transportation. He holds a patent on a machine whose revolving wings are in reality box kites held down by piano wire. Some of the most important contributions to helicopter design and invention in America have been made by Peter Cooper Hewitt, inventor of the mercury arc lamp, and by Emile Berliner, who was originally responsible for the disc talking machine.

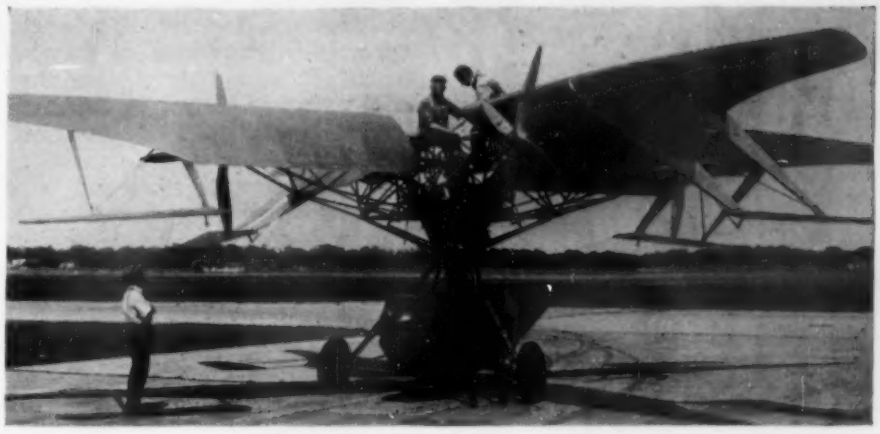
These scientists were doubtless encouraged by the inspiring performance of models, for model helicopters, powered by rubber bands or blockwork, will readily lift themselves from the ground and easily climb to great heights. But when such craft are made large enough to lift real peo-

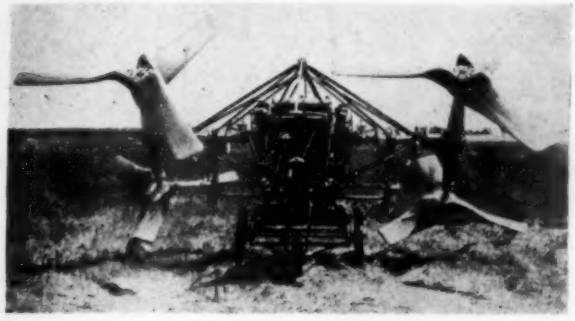


Twenty small, rapidly turning propellers were designed to make this machine rise vertically. It was built in 1909 by Wilbur R. Kimball, of the New York Aeronautical Society.

ple instead of minature humans, there arise many unforeseen difficulties of construction which do not affect the building of models.

Lifting ratios greater than 100 pounds per horsepower are frequently achieved in models, Dr. H. L. Dryden, authority on aerodynamics at the U. S. Bureau of Standards, says but only a fraction of a horsepower is applied to these models and very little weight is lifted. If such ratios held for man-sized craft, a wonder world of air transportation would be opened up. However, difficulties of mechanical construction multiply and laws of aerodynamics become more severe as the size of vertically rising craft is increased.





Top—The latest, the Curtiss-Bleecker helicopter, on which preliminary tests have been made.

Side — Another odd form of vertically rising craft, built by the Leinweber Brothers, of Chicago.

The rotating wings of models can be made very light and do not require the structural bracing necessary in real machines. It is very difficult to design this bracing to combine both strength and light weight.

The wings of models can also be turned much faster than those of big machines because ability to rise depends more on circumferential speed at the wing tip than on revolutions per minute. Hence, to attain the same circumferential speed, a small propeller must make more revolutions than a large one. This speed is easily reached in models by means of elastics or clockwork, but it is very difficult to gear high speed aircraft motors down to about 130 revolutions per minute for the big machines. A heavy, clumsy system of gearing is necessary and much power is lost.

Not So Clumsy

In spite of the fact that the large rotating wings seem awkward and clumsy, they have been found the only solution to the problem of how to rise vertically, Dr. Dryden explains. The first machines attempted were built years ago and used one or more small propellers which turned as fast as those that drive airplanes today. These ships were entirely unsuccessful.

As propeller speed is increased, the power required rises much faster than the force pulling upward. Expressed by the aerodynamic law, power is proportional to the cube of the speed, and thrust, or upward driving force, to the square of the speed.

The rotating surfaces must be large because they take the place of wings of the usual airplane. Their linear speed must compare with airplane speed and yet is limited by fast increasing power.

Some Curious Craft

Some of the first helicopters, whose failure helped to find aerodynamic laws applying to them, were curious craft. One early machine represented a combination between a bicycle and a parachute, and was to be operated by manpower. Safety in descent after the operator got tired pedaling was apparently uppermost in the mind of its inventor.

Twenty propellers were used to operate another, which was built in 1908 and 1909 by Wilbur R. Kimball, of the Aeronautic Society of New York. It had too much gearing and framework and too much weight per horsepower.

As the gasoline motor was improved and more power was concentrated into less space, and as inventors learned that they must use a few large slow rotating surfaces rather than many fast turning propellers, their problem changed, or rather it was half solved. They found that it was comparatively easy to rise up in the air; but, once up, they could not control their machine and bring it slowly and safely back to earth. Many helicopters had a tendency to soar upward, swing over in a great arc and come diving back to the ground head first.

Observation Helicopter

Probably the first successful vertically rising flying machine was the Petroczy-Karman helicopter developed in Austria during the World War. But it could rise straight up and do nothing else. It was tethered to the ground by three cables and as long as these cables were kept taut it could not tip over. It could not be controlled well enough to permit it to sink to earth gradually under a lessening of its own power, but it had to be pulled in by the cables. During one test it was fitted with an electric motor and operated successfully for a few minutes on current supplied from the ground.

The French have sought stability in the Oehmichen helicopter by swinging the whole craft beneath a small balloon. The balloon is by no means large enough to lift the entire weight but its buoyancy helps to keep the craft right side up.

Compressed air was tried by the Leinweber Brothers of Chicago as the stabilizing agent for their machine. The craft was designed so that the least tilt out of balance would swing a pendulum to set in motion a compressed air motor. This in turn was to open valves which would allow air to enter the motor and right the machine instantly. (*Turn to page* 190)

Mother of a Million

MINNESOTA has a grand old fish, one that is recognized by officials of the State Game and Fish Department by a large silver spot in front of her dorsal fin and named Old Silverspot because of it. When first she made her appearance in the nets of the Bemidji Hatchery she was a slim little thing weighing 12 pounds. Now, she is a fat old lady, tipping the scales at 25 pounds, and estimated to be the mother of a million fish. As a grand-mother, her descendants are almost countless.

For ten years, this wall-eyed pike was caught annually in the nets of the State hatchery, stripped of her eggs, and returned to Minnesota waters. One stripping alone netted close to 300,000 eggs, and from them were hatched 297,000 baby pike.

Then, during 1928 and 1929 she was not seen at the hatcheries, and was bemoaned as the victim of some fisherman, or of old age. But this year mourning for Old Silverspot turned to joy when word was long-distanced to hatchery officials that she was alive and well, taken in a net near Cass Lake. They rushed to the scene and found her swimming lazily in a tub. This time her picture was taken, to preserve her record should she not return again.

Back in 1923, Sheridan Greig, at that time in charge of the Bemidji Hatchery, decided that this particular fish should have service stripes and so punched a hole in her fin tail. This in no way injures her nor interferes with her swimming.

Ichthyology

Science News-Letter, September 20, 1930

Gland Product in Cabbage

A NEW substance formed by the suprarenal glands and also found in cabbage and certain other common fruits and vegetables has just been reported to the magazine *Science* by Dr. Albert Szent-Györgyi of the Mayo Foundation in Rochester, Minn.

The new substance is called hexuronic acid. It is related to the starches and sugars, is an extremely active acid, and plays the central role in the breathing system of the cabbage. It is unable to prolong animal life although it comes from that part of the suprarenal gland which is essential to life.

Apparently this gland forms four specific substances. One of these is nalin, formed in the medulla of the gland. This part of the gland also elaborates a substance similar to the newly discovered hexuronic acid which is formed in the cortex of the gland. Finally there is probably a fourth active principle, found in the cortex. This is evidently a vital substance.

Hexuronic acid prevents the formation of pigment or coloring in certain systems of pigment formation. Thus it is found in lemons, oranges, cabbages and similar fruits and vegetables which do not discolor when injured and exposed to air or oxygen. It is not present, for example, in bananas, apples or potatoes. Absence of this acid may be responsible for the discoloration of the skin which occurs in Addison's disease, a condition due to injury to or disease of the suprarenal glands where hexuronic acid is formed.

Dr. Szent-Györgyi gave hexuronic acid to two patients suffering from Addison's disease; with beneficial results. However, the patients were not restored to full activity, he reported.

Medicine

Science News-Letter, September 20, 1930

Sweaty Hands

BESIDES its familiar function of cooling the body, sweat serves as a preventive of chapped hands and feet, Prof. Yas Kuno, physiologist of the University of Manchuria, has discovered.

Unlike the other parts of the body, the palms of the hands and the soles of the feet sweat continuously, without waiting for the thermometer t climb to summer heights. Only in the extreme cold do the sweat glands in these portions of the body stop functioning and allow the skin to dry and chap.

Sweaty hands and feet also have a firmer grip. Workmen sometimes even wet their hands to help them hold a heavy tool but for ordinary activity nature has provided the necessary moisture.

Sweating hands probably date back to man's four-footed days and helped man's ancestors make a safe escape in flight. This was suggested by the fact that sweating of the hands and feet is greatly stimulated by conditions of mental stress, though unaffected by heat as are other portions of the body. Prof. Kuno made his students sweat copiously on the palms by giving them problems in mental arithmetic. There is a saying in Japanese, "with sweat in the clenched hands" which means "with suppressed excitement."

Physiology

Science News-Letter, September 20, 1930

IN VARIOUS CIE

Plants Make Limestone

LIMESTONE, or what will eventually be limestone, is manufactured in thousand-ton lots in shallow lakes in the Middle West. So much is indicated by researches conducted by Prof. H. A. Schuette and Hugo Alder of the University of Wisconsin and the Wisconsin Geological and Natural History Survey at Madison, Wisconsin.

The two chemists analyzed quantities of Chara, a water-weed that grows freely in the ponds and lakes of limestone regions. Its stems and leaves are harsh and rough to the touch, indicating the presence of considerable quantities of minerals. The analyses showed the sand-free, air-dry plants to contain over 41 per cent. of ash, of which the larger proportion was calcium carbonate, captured out of solution in the lake water.

In the lake where the analyzed samples were collected, about half the mass of the yearly crop of aquatic plants is accounted for by Chara. With this as a basis, Prof. Schuette and Mr. Alder calculated that this one plant yearly returns to the bottom of this lake something like a thousand tons of calcium carbonate.

Geology

Science News-Letter, September 20, 1930

Rays from Potassium

THE COMMON chemical element potassium gives off gamma rays similar to X-rays or the gamma rays of radium. At the State Radiological Institute, Prague, Dr. F. Behounek has confirmed the researches of Dr. W. Kohlhörster which gave evidence of these rays from potassium about two years ago.

Dr. Behounek finds that potassium chloride really emits gamma rays, the intensity of the rays being proportional to the amount of potassium. He also finds that there are two groups of gamma rays, one about as penetrating as the similar rays from radium, the other about twice as penetrating. However, their intensity is very low, so that very delicate apparatus is needed to detect them.

Chemistry

Science News-Letter, September 20, 1930

S CIENCE FIELDS

Fire Fighting Ants

BIG black ants are among the world's most expert fire-fighters, is the conclusion of Ranger F. S. Garl, of Yosemite National Park. Ranger Garl believes that human beings might find it worth-while to study the tactics of the ants.

Describing one blaze, caused by a lighted match near a big black ant hill, Ranger Garl said that about 50 ants started promptly for the fire and jumped right into it, kicking and biting. Meanwhle other ants kept on with their work.

Then a lighted cigarette was thrown near the match, and a larger force of ants hastened to the scene and destroyed the cigarette. Some of the heroic little firemen were burned to death, or so badly burned that others killed them. But for every ant disabled, another took its place. After the fire was out, other ants were sent to pick up the fallen.

Throughout the emergency, lasting half an hour, the fire was fought in the most orderly manner, attesting to a highly efficient organization, Ranger Garl said.

Entomology

Science News-Letter, September 20, 1930

Prussia's New Bird Laws

NEW AND uniform protective laws for birds and wildflowers have been enacted by Prussia, revising and replacing the old codes that obtained in the various provinces of the state, which were frequently at variance with each other. The new laws specify what game birds may be hunted and when, they list thirteen "outlaw" species that may be killed without restriction at any time, and they give all the rest of the bird population the benefit of an absolute closed season.

During the proper open seasons the following birds may now be hunted in Prussia: wild ducks, wild geese, osprey, most of the quail family, sandpiper, curlew, snipe, gulls, terns and pigeons. Outlaw birds include several hawk species, all crows, sparrows, grebes and herons. Certain birds, like ospreys and kingfishers, that are protected generally may still be shot if necessary for the protection of fishponds.

There will be no more bounties paid for the destruction of predaceous birds. Bird lime and traps or other devices for catching or injuring birds must not be used, and birds must not be hunted with the aid of artificial lights.

Certain wild animals that destroy birds, but also prey on troublesome rodents to an even greater extent, are given absolute protection. Notable among these are wildcat, pine marten, mink and dormouse.

The new list of prohibited plants contains thirty names, mostly of species which have been subjected to destructive collecting by dealers. In some cases very common and popular wildflowers, such as lily-of-the-valley, snowdrop and hepatica, may be gathered for bouquets, but their roots or bulbs must not be disturbed.

Game Conservation

Science News-Letter, September 20, 1930

Why Delinquent?

PSYCHIATRISTS who probe into the minds and the conduct of delinquent boys and girls should not fail to look into the families that those boys and girls live with, is the belief of Dr. Bryant E. Moulton, of the Judge Baker Foundation of Boston.

"Very frequently, more psychiatric work should be done with the family than with the child to get any lasting results," Dr. Moulton stated. "Many of our transient cures upon which we spend considerable time would have been permanent if the family background had been altered."

One ten year old boy who was sent to Dr. Moulton had a persistent tendency to run away. The root of this desire was found only when home conditions were investigated, and it was shown that the child was overwhelmed by the sense of family insecurity. His father was employed very irregularly, and there was much anxiety and agitation about making ends meet, with frequent scraps between father and mother over the payment of bills. Such conditions alarm and depress a child by the feeling that the home is insecure, and the child's reaction may take various forms which neither he nor the parents understand, it is found.

Ignorance on the part of parents, also prudishness, fanaticism, are so common that they are frequently overlooked as contributing causes of a child's strange or unsocial behavior, Dr. Moulton explained.

Psychiatry

Science News-Letter, September 20, 1930

Kitchen In Pompeii

POMPEII and Herculaneum, most famous of tragic cities, are still showing the modern world new evidences of what everyday life was like two thousand years ago. The new policy of excavators at Pompeii is to leave everything where it is found, if possible. The cooking stove shown on the cover of this week's SCIENCE NEWS-LETTER is at a home in the Street of Abundance.

Grace and variety of form mark the pots and cooking utensils that accompany the old stove. Obviously, kitchen work in these Old World cities was made pleasanter by the artistry of the tools.

"The taste and skill of the metalworkers of Herculaneum and Pompeii is almost beyond belief," declares Arthur S. Riggs, editor of *Art and Archaeology,* who has just returned from the scene of present excavations. "Every cooking utensil even was given its peculiar touch of beauty as well as useful form. Sauce-pans, skillets, pitchers, cups, ladles, lamps, knife handles, chains, everything of bronze or copper for use about stove or sink, was lovingly worked into designs whose grace is only to be equaled by the most highly skilled silversmith work of the present. There were evidently no "Five and Ten" stores in Herculaneum at which housewives could buy cheap kitchenware."

Archaeology

Science News-Letter, September 20, 1930

New Standard for Paper

WHETHER she is writing her love notes on paper that will outlast her life or on sheets that will crumble in a few brief years will be information supplied gratis with stationery purchased by romantic maids —and everybody else, for that matter —if a suggestion made by B. W. Scribner to the American Society of Mechanical Engineers, is adopted.

Paper is now graded on a basis of fiber quality but this gives no clue to its aging qualities, which are extremely important in all papers except those for temporary use.

If such a classification were adopted it would be possible to buy papers according to the purpose intended: (1) Permanent papers, (2) papers having a minimum life of 100 years, (3) papers having a minimum life of 50 years, and (4) papers for temporary use.

Standards

Science News-Letter, September 20, 1930

Discovering The Alkali Metals

— A Classic of Science

Chemistry

At The Dawn of Our History Man Knew The Oldest Alkalies--The Newest of These Elements Has Been Found Just This Year.

The lyes or alkalies soda and potash were known from earliest times. Davy proved them to be compounds of metals. Three new alkali metals have been isolated and proved similar to the original ones. Only a few months ago came news of the sixth and last member of the group.

Lithium

Analyses de quelques minéraux de la mine d'Utô en Suède, dans lesquels on a trouvé un nouvel alcali fixe. Par M. Auguste Arfwedson. Traduit de Afhandlingar i Kemi, Fysik och Mineralogie; tom. VI. Stockholm, 1818.

Published in Annales de Chimie et de Physique, Vol. X, Paris, 1819. Tanslated for the SCIENCE NEWS-LETTER *by Helen M. Davis.*

IN the mine of Utò, which from a remote time has been one of great importance in mineralogy, there have been found from time to time different minerals on which much work has been done to try to determine their chemical composition, especially during recent years. There are nevertheless among them some which, although well known so far as their external characteristics go, have never been the object of a chemical examination; and among those which have already been examined, there is too little agreement between the results of the analyses to enable a positive conclusion to be drawn about their composition. It is for these reasons that I have made several of these minerals the object of my researches. . . . .

[*The mineral Pétalite was selected and subjected to a program of analysis, from which it was found to contain silica, alumina and sulphates. —Ed.*]

But it was still necessary to learn the base of the salt. Its solution could not be precipitated either by tartaric acid in excess or by platinum chloride. Consequently it could not be potassium. I mixed another portion of a solution of the same salt with a few drops of pure potash, but without its becoming cloudy. Therefore, it contained no more magnesia: hence it must be a salt with soda for a base. I calculated the quantity of soda which would be necessary to form it; but it always resulted in an excess of about 5 parts in 100 of the mineral analyzed. So, since it seemed to me probable that the different substances might not have been well washed, or that the analysis in other ways might not have been made with sufficient exactness, I repeated it twice more with all the care possible, but always with results very little different. I obtained: Silica: 78.45, 79.85; Alumina: 17.20, 17.30; Sulphate: 19.50, 17.75.

At last, having studied more closely the sulphate in question, I soon found that it contained a definite fixed alkali, whose nature had not previously been known. M. Berzelius proposed to give it the name of *lithion* (from the Greek word *lithios, stone*), because this alkali is the first found in the mineral kingdom.

Sodium and Potassium

The Bakerian Lecture, on some new Phenomena of chemical changes produced by electricity, particularly the decomposition of the fixed alkalies, and the exhibition of the new substances which constitute their bases; and on the general nature of alkaline bodies. By Humphry Davy. Read Nov. 19, 1807. Reprinted by the Alembic Club, Edinburgh, 1901.

A SMALL piece of pure potash, which had been exposed for a few seconds to the atmosphere, so as to give conducting power to the surface, was placed upon an insulated disc of platina, connected with the negative side of the battery of the power of 250 of 6 and 4, in a state of intense activity; and a platina wire, communicating with the positive side, was brought in contact with the upper surface of the alkali. The whole apparatus was in the open atmosphere.

Under these circumstances a vivid action was soon observed to take place. The potash began to fuse at both its points of electrization. There was a violent effervescence at the upper surface; at the lower, or negative surface, there was no liberation of elastic fluid; but small globules having a high metallic lustre, and being precisely similar in visible characters to quicksilver, appeared, some of which burnt with explosion and bright flame, as soon as they were formed, and others remained, and were merely tarnished, and finally covered by a white film which formed on their surfaces.

These globules, numerous experiments soon shewed to be the substance I was in search of, and a peculiar inflammable principle the basis of potash. I found that the platina was in no way connected with the result, except as the medium for exhibiting the electrical powers of decomposition; and a substance of the same kind was produced when pieces of copper, silver, gold, plumbago, or even charcoal were employed for compleating the circuit. . . . .

Soda, when acted upon in the same manner as potash, exhibited an analogous result; but the decomposition demanded greater intensity of action in the batteries, or the alkali was required to be in much thinner and smaller pieces. With the battery of 100 of 6 inches in full activity I obtained good results from pieces of potash weighing from 40 to 70 grains, and of a thickness which made the distance of the electrified metallic surfaces nearly a quarter of an inch; but with a similar power it was impossible to produce the effects of decomposition on pieces of soda of more than 15 or 20 grains in weight,

and that only when the distance between the wires was about one-eighth or one-tenth of an inch.

The substance produced from potash remained fluid at the temperature of the atmosphere at the time of its production; that from soda, which was fluid in the degree of heat of the alkali during its formation, became solid on cooling, and appeared having the lustre of silver.

Cesium

On a New Alkali-Metal, by MM. Bunsen and Kirchhoff. In Chemical News, London, Nov. 24, 1860.

IN a recent number of the *Philosophical Magazine* there is given an account of some researches by MM. Bunsen and Kirchhoff on the effect produced by various metals on the spectrum of a flame in which their chlorides are volatilised. That part of their investigation which is more particularly interesting consists of a method of photochemical analysis of exquisite delicacy, which the authors have specially studied in relation to the alkali-metals.

These metals have been employed in the form of chlorides which have been purified with the greatest care. When these are introduced into a jet of flame they volatilise to a greater or less extent, and then communicate to the flame the special character above alluded to, and which is observable when the spectrum produced by the flame is examined by a sufficient magnifying power.

The above-named memoir is accompanied by a colored plate which illustrates the spectra of the alkali-metals with their characteristic rays. These rays are the more visible in proportion as the flame is less luminous and its temperature higher. The ordinary Bunsen gas-burner answers admirably for these experiments. The rays shown by the chlorides of potassium, sodium, and lithium are perfectly well-defined; those of barium, strontium, and calcium are more complicated, and require a somewhat experienced eye for their identification. They are, however, quite distinct enough to be easily recognized, even when the salts of these metals are mixed together; for the great advantage of this method of analysis is, that foreign matters have no influence on the results, the authors being able to detect with certainty the different elements in a mixture containing the tenth of a milligramme of the metals mentioned above. Sodium, with its yellow ray, first appears; after that the well-defined red ray of lithium; next is seen the paler rays indicating potassium; and, after these rays have disappeared, they are replaced by those of calcium and stron, tium, which remain visible for some time. The absence of one or other of these sets of rays shows the absence of the corresponding metals. . . . .

HUMPHRY DAVY
The man who found the metallic bases in the caustic alkalies.

With so delicate a reaction as the one just described, of an almost infinite sensibility, and applicable to all metals, the presence of elements, existing in so small quantities as to entirely escape ordinary analysis, may be rendered visible. Many observations tended to this point, and MM. Bunsen and Kirchhoff now announce definitely (*Annal. der Physik und Chemie*) that they have discovered a new alkali-metal, the fourth member of the group of potassium, sodium, and lithium. At present they have only found it in very small quantities in the mineral water of Kreuznach, in the saline water of Dürckheim, and in one of the sources of the Bade—the Umgemach.

The chloride of the new metal differs from those of sodium and lithium by the yellow precipitate which it produces in the presence of bichloride of platinum. It is distinguished from potassium by its nitrate being soluble in alcohol. Introduced into a flame, and examined with a prism, the vapors of the new chloride show a very interesting spectrum, consisting of two blue lines, one of which, the fainter, almost corresponds with the blue of strontium; the other, also a well-defined blue line, is situated a little further towards the violet extremity of the spectrum, and rivals the lithium line in brightness and distinctness of outline.

Rubidium

On a Fifth Element belonging to the Alkali Group, by Professor Bunsen. Reported from Bericht. der Akad. der Wissensch. zu Berlin, 1861, in Chemical News, London, June 15, 1861.

IN the investigation of the new metal having so close an affinity to potassium, and which has been called caesium by Bunsen, there appears to exist, besides this caesium, yet a fifth alkali metal, which has hitherto escaped notice, and which appears to resemble potassium quite as much as caesium does.

The platinum salt of caesium is with much more difficulty soluble in water than that of potassium. If we attempt to separate the latter from the former by repeated boiling with water, we find that in proportion as the quantity of potassium diminishes, and the continuous potassium spectrum between Ka *alpha* and Ka *beta* becomes faint, new lines appear, and among these in particular two very intense ones in the violet between Sr *delta* and Ka *beta*. A point is soon reached at which the quantity of potassium is no longer diminished by boiling with water. This occurs when the united atomic weight of the metals combined with chlorine and platinum is 109 (H = 1). If, now, a mixture of the hydrates of potassium and caesium be prepared from the platinum compounds, and about a fifth of this mixture be converted into carbonate, then absolute alcohol will abstract from the dried mixture almost exclusively hydrate of caesium. If this operation be repeated, a limit is at length reached at which that which is dissolved in the alcohol has a constant composition. This occurs when the atomic weight has risen from 109 to 123.4 (H = 1. The substance which possesses this enormous atomic weight (next to gold and iodine, the greatest known[1]) forms a deliquescent hydrate, as caustic as hydrate of potassium; it forms an equally deliquescent car-

[1]Atomic weights of the elements were imperfectly known in 1861. Gold is exceeded in atomic weight by mercury, lead, and bismuth, all well known at that time, and iodine is also exceeded by barium. Bunsen was working with a mixture of cesium and rubidium. The weight of cesium turned out to be higher than that of his heavier fraction, that of rubidium lower than his lighter one.

bonate, which, at ordinary temperatures, is soluble to the extent of 10 parts in 100 of absolute alcohol; and an anhydrous nitrate, which crystallizes, not rhombic, like nitre, but hexagonally, and by a hemiedral form, is isomorphous with nitrate of sodium, etc.

The spectrum of this substance, purified up to an atomic weight of 123.4, shows the blue caesium lines with great intensity, but the violet lines of the unpurified substances (atomic weight 109) so faintly, that a slight addition of chloride of potassium, which scarcely affects the lines Cs *alpha*, makes them disappear at once, on account of the brightness of the ground produced by the potassium. The few grams of material for this investigation were obtained from 44,000 kilograms of the Dürkheim mineral water. By a repetition of the process, from 150 kilograms of Saxon lepidolite, there was obtained by the first treatment with chloride of platinum, a product which exhibited the violet lines between Sr *delta* and Ka *beta* with the utmost intensity, but no traces of the lines Cs *alpha*. If this platinum salt from lepidolite had been a mixture of the caesium and potassium compounds, the blue lines Cs *alpha* must have been visible along with the violet ones, because in the product obtained from the Dürkheim water, the violet ones disappear, first on the addition of chloride of potassium, and the caesium lines much later, and, indeed, only when the potassium salt is in very great excess. It follows that there must exist, besides, potassium, sodium, lithium, and caesium, yet a fifth alkali-metal, which occurs in Dürkheim, Kreuznach, and other mineral springs, in small, but in lepidolite in larger quantities.

Element 87

Evidence of the Presence of Element 87 in Samples of Pollucite and Lepidolite Ores, by Fred Allison and Edgar J. Murphy, Alabama Polytechnic Institute, January 11, 1930, published in the Physical Review, February, 1930.[2]

ELEMENT 87 is peculiarly well placed in the periodic table for detection by a new and very sensitive method recently reported by us. (Phys. Rev. 35, 124 [1930].) We have accordingly made a search for this element in samples of pollucite and lepidolite ores supplied by the Research Laboratory of the General Electric Company, and we have consistently found minima at points of the scale which correspond to an element of the atomic weight and the valence ascribed to eka-caesium. We have studied the substance in the chloride, sulphate, nitrate and hydroxide compounds, in each case finding the minima at points of the scale characteristic of an element of the chemical equivalent of eka-caesium. Since the same element in different compounds produces its characteristic minima of light at different points of the scale, the fact that minima are observed in each of the four compounds at the points appropriate to element 87 affords evidence of considerable weight for its presence in the sample under test. The element appears to have several isotopes, as judged by the number of its characteristic minima. The method employed is sufficiently delicate to detect less than one part of a compound in 10^{10} parts of water. The work is still in progress.

Science News-Letter, September 20, 1930

[2]For popular account of this discovery, see Science News-Letter, Vol. XVII, No. 462, Feb. 15, 1930.

Peyote Button Induces Religious Fervor

Ethnology

Strange Indian Cult Studied by Scientist

WITH a tall pointing tipi for a church and the buttons of a peyote plant as a source of religious inspiration and power, Indians of Oklahoma conduct one of the old, least understood religious cults in America. The incorporated name is the Native American Church.

To straighten out the tangle of scattered facts and incomplete understanding about this church and its use of peyote, Dr. Maurice Smith of the University of Oklahoma, and his wife have just spent ten weeks among Oklahoma tribes that are the fountain source of the spreading cult. Dr. Smith attended several of the long peyote ceremonies. The Smiths interviewed the leading theologians and many dozen followers of the cult and also Indians who hold no faith in the powers of peyote.

"The peyote ceremony is an all night affair," said Dr. Smith, when in Washington to consult old, unpublished material on peyote in the possession of the Bureau of American Ethnology. "The Indian leader places a button of the sacred peyote plant on the altar fire. Other buttons are passed around and chewed by the Indians, who then sing and pray."

The effect of the buttons has been reported by a number of white men who tried small quantities on themselves, but their reports do not altogether jibe with the reports of Indians long accustomed to taking the drug, Dr. Smith found. In general, peyote affects the senses. Space and perspective alter, colors become more brilliant, and time flows by at a leisurely pace.

Peyote has no serious after effects, according to Havelock Ellis and other investigators, except that white men unaccustomed to its use are likely to be made even sicker than a small boy with his first cigar. To the Indian, the white man's observations on how peyote alters the world about him would seem obvious and unimportant, for the Indian is concerned with peyote as a medicine and as a source of religious feeling.

"At the peyote ceremony, among some tribes, it is customary for speakers to tell their religious experiences, if the spirit moves them." Dr. Smith said. "Through the night they sing, even as many as two hundred different songs, to the accompaniment of the kettledrum and the gourd rattle. Sometimes a healing ceremony is held for some sick person. Whether the peyote has any therapeutic value is one of the points that we know nothing about.

"We observed particularly the infusion of Christian ideas into the speeches and prayers. Bible ideas blend simply and naturally in the Indian mind with the old native theology."

Dr. Smith and his wife have been delving into the great collection of unpublished notes on peyote assembled by the late James Mooney for the Bureau of American Ethnology during a period of thirty years. Mr. Mooney was the first to try to understand the Indian's use of peyote and to explain it to science.

Science News-Letter, September 20, 1930

Defense of Tropical Forests Planned

Forestry

International Experts Seek to Forestall Plant Disease

PLANS for protecting the great tropical forests of the Americas from careless exploitation, such as has laid waste the forest sections of other parts of the world, were discussed at the meeting of the first Inter-American Conference on Agriculture, Forestry and Animal Industry in Washington. The conference was attended by representatives of all of the 21 American republics.

Forest land in the 20 Latin American republics is estimated to cover an area of 3,000,000 square miles, which is larger than the total area of continental United States exclusive of Alaska, William R. Barbour, forester of the Tropical Plant Research Foundation said. So little research has been done in these forests that only vague guesses can be made as to the volume of standing timber in them. A safe estimate places it at at least six thousand billion board feet.

"Too little is yet known about the forests of tropical and subtropical countries," said W. T. Cox, consulting forest engineer of the Tropical Plant Research Foundation. He urged extensive forest exploration aided by airplane, so as to get not only botanical information of the numerous trees but also commercial classifications. Training of young men in forestry and the development of these vast forests along scientific principles were advised.

"In the two Americas constructive forestry is still in its beginning," said Dr. E. P. Meinecke, plant pathologist of the U. S. Department of Agriculture, Bureau of Plant Industry. "The nations of the two Americas have a common interest in building up their forests for the benefits of coming generations and to this goal the protection of the forests against disease is one of the most promising and essential conditions."

The greatest menace from killing forest epidemics has come through the accidental introduction of forest diseases. The science of forest pathology, which would take care of these disease conditions of trees, must be organized on international lines in order to find its true place in modern forestry, he declared.

The danger of looking for temporary reward rather than for ultimate benefit in the cutting down of forests and development of the land for other purposes was described by Prof. D. M. Matthews of the University of Michigan School of Forestry and Conservation. The reckless waste of trees which results from using the land for other purposes is not the only evil. The removal of the forest cover may have a bad effect on the productive capacity of other permanent agricultural areas in the region, he pointed out. This is too frequently overlooked in the clearing of land.

Other speakers emphasized the need of studying the little-known woods of these forests with a view to their possible uses in future decades when both Latin American countries and the United States will have to turn to these forests for most of their lumber.

Dread Soil Erosin

The sinister scourge of soil erosion, which in this country has already destroyed enough land to support a nation, was described by H. H. Bennett of the bureau of chemistry and soils, U. S. Department of Agriculture.

"Not less than 126,000,000 pounds of plant food are being washed out of the fields of America every year," Mr. Bennett said. "Something like 17,500,000 acres of land that were formerly cultivated in this country have been destroyed by gullying or so severely washed that farmers can not afford to attempt their cultivation or reclamation. This is enough land to support a nation. It exceeds the total area of arable land in Japan."

An even vaster area of land has been injured by sheet erosion. This is a slower process of erosion, as distinguished from gullying, which removes a film of soil from entire fields whenever it rains enough for water to run downhill. Erosion operates chiefly on topsoil, the most productive part of the land. This is the humus layer, that vital part of the soil from which plants get their principal nourishment. When it is washed off, clay subsoil is generally exposed.

Mr. Bennett described some of the areas in various parts of the country where as much as 40 inches of soil has been lost through erosion since the land has been under cultivation. In some places land has been washed away to the underlying rocks.

Removal of trees from the slopes, destruction of prairie grasses by tillage, and disturbance of ground stability by plowing, overgrazing, excessive burning, freezing and thawing have resulted in this intensified soil impoverishment.

Cropping schemes, construction of terraces, soil-saving dams and vegetative obstructions are some of the means of reducing the evils of soil erosion, Mr. Bennett said. These have been tried in different sections of the country, particularly the south and west, and good results are already being reported.

We are not yet on the verge of a land shortage but we are getting closer every year to a shortage of good land. Much of the losses already revealed by an expert survey can be reduced but the problem must be vigorously attacked at once.

A tremendous amount of awakening among farmers, landowners, bankers, merchants and others, to the seriousness of the problem is necessary, as well as a vast amount of research and demonstration work, Mr. Bennett said.

In regions where some of the land-saving measures are already being tried, it has been found that both the quantity and quality of the crop has improved. In the cotton crop, for instance, it was found that uneroded land, that is land which had not lost its topsoil, produced more lint cotton per acre, more seed, and the seed itself yielded more oil. Since cotton-seed may be bought on the basis of oil content in the near future, this last is considered an important discovery.

Nature Fights Disease

The very best method in the control of plant diseases is probably Nature's method of control through selection and breeding of resistant species and varieties, Dr. Merton B. Waite of the U. S. Bureau of Plant Industry said at the Conference.

"One of the most striking things

in plant pathology is the development of disease control methods based on scientific research," he continued. Most of these methods have been developed within the last 50 years, many within 25 years. These include spraying and dusting with fungicides, disinfection, eradication, control of the carriers, sanitation, cultural and handling methods, breeding and selection of resistant species and varieties, and quarantines. Spraying has become one of the leading methods in spite of the expense and trouble which it entails. The practice of quarantine regulations makes it reasonably certain that new plant material may be introduced into a country without introducing diseases.

The loss through insects and plant diseases in the United States each year amounts to $3,000,000,000, Lee A. Strong of the Plant Quarantine and Control Administration, U. S. Department of Agriculture, reported to the Conference.

"Fully 50 per cent. of the important pests responsible for this enormous loss are of foreign origin, practically all of them having been introduced prior to the passage of the Plant Quarantine Act of 1912," he said. He explained the authority under which these quarantines are carried out and how they operate.

Comparatively little is known of the insect problems of South America, Dr. W. Dwight Pierce, entomologist, formerly of the U. S. Department of Agriculture, said. It would take a long time and many men to make a complete survey of the insect life of the Americas. Consequently he suggested that the Pan-American Union or the Tropical Plant Research Foundation maintain a small staff of specialists in the various branches of agriculture, including entomology, who will be constantly available to the various countries to make surveys of the more important economic problems and to give practical advice.

Death to Weeds

No short cuts or easy methods exist for controlling the weeds which cost farmers of the United States several hundred million dollars each year, M. W. Talbott of the U. S. Bureau of Plant Industry told the delegates.

"In the main, the old doctrine of hard work and plenty of it must be observed," he said. "The three main methods of weed control are: prevent weeds from maturing seed; prevent the introduction of weed seeds; and prevent perennial weeds from making top growth."

For the first method he advised tillage, mowing and pasturing with livestock. The second is more difficult and often requires comunity action to keep down the introduction of weed seeds. For keeping down the top growth of perennials, he recommended clean cultivation, smother crops, pasturing, frequent cutting and the application of chemicals. This last must be done with care, however.

Successful Tick War

The success of a 24-year war against the cattle tick, cause of the costly animal disease known as southern Texas or tick fever, was reported by W. W. MacKellar of the U. S. Bureau of Animal Industry. "It is possible and practicable to eradicate the cattle tick permanently from any section," Mr. MacKellar declared.

When this eradication project was started in 1906, 983 counties with a total area of 728,565 square miles were under Federal quarantine because of tick infestation. At the close of 1929 the quarantined area had been reduced to 184 counties containing 151,198 square miles.

Science News-Letter, September 20, 1930

Man's Efforts to Fly Straight Up—*Continued*

Since the World War there has been no want of helicopter inventors and trial machines. They are found in nearly every country. Even if such craft must be tied down with a rope, it has been learned that they are often better for observation purposes in war than captive balloons. They cannot be seen from a great distance, are small targets and require few men in their ground crews.

Among other helicopters which have been the subject of extensive research during the past decade is one developed by Louis Brennan for the British government. Great secrecy surrounded its building and tests.

In America both the de Bothezat and the Berliner helicopters are said to have made short flights. The de Bothezat machine had four propellers arranged radially on the same level over a framework to which the engine was fixed.

Dr. Berliner and his son, Emory A., of Washington, built a machine which made use of an airplane fusilage. But instead of wings there were two propellers which turned in opposite directions to lift the machine vertically. Horizontal motion was gotten by means of a three-foot propeller near the tail of the ship to tilt the entire machine by raising and lowering the tail.

Marquis Pateras Pescara has used two propellers, one above the other, rotating in opposite directions. He is reported to have remained in the air more than eight minutes and to have flown over 3,000 feet in Paris early in 1924.

A German engineer, Englebert Zaschka, has designed a helicopter in which a gyroscope is used to increase stability. It also serves as an energy accumulater for a gliding flight. Gliding flight is this case means a straight descent.

While many engineers were seeking vertical flight directly, Juan de la Cierva, a young Spanish scientist and former member of parliament, decided to make a cross between a true airplane and a true helicopter. In effect, he stripped the wings from an ordinary biplane and erected above the ship four windmill blades which turn in a horizontal plane and are free to move at will, being connected to no source of power.

When he tested his machine in 1923 he found he had a ship that would not remain stationary in the air, but it would travel very slowly indeed. He could throttle it down to 20 or 30 miles an hour. It would not climb straight up but it would rise at a very sharp angle, much sharper than that at which airplanes ascend.

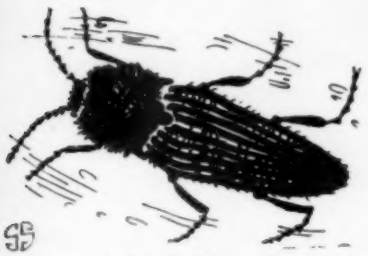
In Italy Signor M. Isacco has apparently attempted to convert the autogiro into a helicopter. He calls his machine the helicogyre. A casual examination shows it to be an autogiro with small motors built in the revolving wing tips. This makes the rotating wings independent of the backwash of the propeller for their motion.

The newest helicopter, the Curtiss-Bleecker machine, is the invention of Maitland B. Bleecker, who began to plan his machine when a student at the University of Michigan.

Science News-Letter, September 20, 1930

NATURE RAMBLINGS

By Frank Thone



Click-Beetle

If you chance to catch a dark, moderately slender beetle with a strongly marked crease where the wing-cases join the thorax, hold him tight or he won't stay caught long. There will be a sudden snap and click, and up in the air he'll catapult, flying end over end to many times his height. He comes down most any-old-way, and immediately scuttles for safety.

Like most beetles, he is usually helpless when he falls on his turtle-shell back, but he doesn't need to stay there, kicking impotently, as most beetles do in that unfortunate position. He simply clicks again, and maybe this time he lands right side up after his catapult flight. If he doesn't, he just keeps on clicking and tossing himself up like a flapjack until he finally comes down on his feet.

Presumably this curious behavior is of much the same value to the click-beetle as the ability to make long and erratic jumps is to fleas, frogs and kangaroos. Only unlike these creatures thus blessed with folding hindlegs, the click-beetle uses his mode of salvation only in emergencies.

The method of making such a catapult-jump is simple enough. The body, as is evident from a superficial examination, is a hinge. It is, moreover, a spring hinge, with the tension of the springs under the control of the beetle. When he wants to make use of the spring he raises his thorax at an angle, whacks his forehead sharply on the ground, and thus lifts himself, if not by the bootstraps at least by the spectacle-bows.

Science News-Letter, September 20, 1930

New types of hybrid trees now being grown in New York State are expected to reach in eight years a size equal to that attained by natural varieties in 45 years.

Hazards That Follow The Hurricane

Medicine

TYPHOID fever, malaria, small pox, influenza and dysentery are the chief diseases expected to follow in the wake of the hurricane which has ravaged Santo Domingo.

Typhoid fever particularly may be expected in any catastrophe in which water supplies and sewage systems are disrupted. This is because the germs of typhoid are water borne, and people are infected by eating or drinking contaminated food, water and milk. The same is true of dysentery.

Malaria and influenza were very prevalent in Porto Rico after a hurricane swept that island two years ago. The same diseases may afflict the people of Santo Domingo. Weakness from exposure and lack of food would make a large part of the population susceptible to all diseases, and malaria is prevalent there at all times while a few cases of influenza are reported regularly there as in most other countries.

Diseases Reported

In a health report from Santo Domingo, typhoid fever, malaria, tetanus, dysentery, influenza, tuberculosis, measles, whooping cough, a very little diphtheria and a little yaws were reported to the Pan-American Sanitary Bureau. Under present conditions with the sanitary system broken down and the people crowded together with little or no food and shelter, any of these may be greatly increased. There is some danger of a smallpox outbreak, although this is not as likely to occur as outbreaks of the water-borne diseases like typhoid and dysentery.

Yellow fever once had its home and stronghold in the West Indies, but there have been no epidemics and few cases there in recent years. It is not likely that it will break out now although the possibility exists.

Typhus fever has long been known as the disease of poverty, privation and overcrowding. There is little danger of an outbreak of this disease in Santo Domingo just now because the disease has not been known there in several years.

Other diseases which frequently follow great disasters are plague and cholera. In the East Indies severe outbreaks of both of these might be expected after such a catastrophe. However, neither plague nor cholera occur often in the West Indies and it is unlikely that outbreaks of either will appear now.

Definite information on the disease picture in Santo Domingo is still lacking. Gangrene from infected wounds and injuries seems to be the most pressing health consideration, the American Red Cross has reported. Anti-typhoid vaccinations will be given as rapidly as possible in the hope of averting an epidemic of that disease.

Science News-Letter, September 20, 1930

A psychologist who looked into children's beliefs about clouds found that many children think that clouds are close enough to be reached from the trees or housetops.

Hurricanes are one of the climatic features of the Antarctic.

FIRST GLANCES AT NEW BOOKS

PRIMITIVE METHODS OF WORKING STONE BASED ON EXPERIMENTS OF HALVOR L. SKAVLEM—Alonzo W. Pond—*Logan Museum, Beloit College,* 143 p., $1.15. A chance attempt to chip some flints with bits of bone, as the Indians might have done, led Halvor Skavlem of Wisconsin to experiment for seventeen years with primitive stone-working techniques. He has tried out different angles of fracture, different types of blows, and different qualities and kinds of stone. He has shown that the Indian's stone age tools and weapons could be rapidly and skilfully made, and did not represent tedious effort. This description of his remarkable studies is illustrated with numerous plates.

Archaeology

Science News-Letter, September 20, 1930

FIFTY-TWO YEARS OF RESEARCH, OBSERVATION AND PUBLICATION, 1877-1929, Henry Fairfield Osborn—*Scribner's,* 160 p., $1.50. The career of the president of the board of trustees of the American Museum of Natural History is set forth in this book, with bibliography and extensive comment upon his many activities.

Biography

Science News-Letter, September 20, 1930

CONTRIBUTIONS TO FOX ETHNOLOGY, 2—Truman Michelson—*U. S. Govt. Printing Office,* 183 p., 75c. Two papers, "A Sketch of the Buffalo Dance of the Bear Gens of the Fox Indians," and "Notes on the Great Sacred Pack of the Thunder Gens of the Fox Indians," comprise this new publication of the Bureau of American Ethnology.

Ethnology

Science News-Letter, September 20, 1930

BACTERIOLOGY—Estelle D. Buchanan and Robert Earle Buchanan—*Macmillan,* 532 p., $3.00. The third edition of a comprehensive text for college students taking a general or household science course. This edition includes a discussion of bacteriophage, and the sections on enzymes, immunity and the Brucella group have been considerably expanded to meet recent developments in these fields.

Bacteriology

Science News-Letter, September 20, 1930

HOME PROBLEMS OF PARENTS—Florence M. Teagarden—*Univ. of Pittsburgh,* 90 p., 60c. Eight radio talks by a psychologist are gathered into this pamphlet. Some of the subjects are a little out of the ordinary run of topics covered in current books on children: the child and his money, for example, the psychology of the sick child, chums, and the psychology of children's clothes.

Psychology

Science News-Letter, September 20, 1930

SCIENCE IN THE SERVICE OF HEALTH—Elliot R. Downing—*Longmans, Green,* 320 p., $2. This text for secondary school classes in hygiene follows the excellent style and concise, yet interesting arrangement of the other books of the same series. Dr. Downing is associate professor of the teaching of science in the University of Chicago school of education.

Hygiene—Medicina

Science News-Letter, September 20, 1930

CONTRIBUTION TO THE BIOLOGY OF THE PACIFIC HERRING, CLUPEA PALLASH, AND THE CONDITION OF THE FISHERY IN ALASKA—G. A. Rounsefell—*Government Printing Office,* 93 p., 35c. Of interest to economic ichthyologists and fisheries men.

Ichthyology

Science News-Letter, September 20, 1930

GENETICS—H. E. Walter—*Macmillan,* 359 p., $2.50. A third edition of a successful textbook. The author has a gift for turning salty phrases that quite kills any "textbooky" flavor, and a hard common sense that steers him safely through the very rocky channel of eugenical discussion.

Genetics

Science News-Letter, September 20, 1930

STUDIES ON ROCKY MOUNTAIN SPOTTED FEVER—R. R. Spencer—*U. S. Government Printing Office,* 116 p., 35c. A bulletin of the Hygienic Laboratory of the U. S. Public Health Service giving the latest facts of the service's investigations of this disease. Of limited interest but of considerable scientific importance.

Medicine

Science News-Letter, September 20, 1930

A CHAPTER OF CHILD HEALTH—Child Health Demonstration Committee—*Commonwealth Fund,* 169 p., $1. The physical reformation of the youth of an area in Georgia, accomplished by one of the Commonwealth Fund child health demonstrations, is told in this volume. The description of the techniques used is aided by photographs and attractive charts. The demonstration was conducted in Clarke County and Athens, Georgia.

Public Health

Science News-Letter, September 20, 1930

THE BUREAU OF ENTOMOLOGY—Gustavus A. Weber—*The Brookings Institution,* 175 p., $1.50. The federal headquarters and the far-flung field forces of America's fight against the insects is the subject of this organizational study, the sixtieth of the series of Service Monographs of the United States Government. The present educational and research activities of the bureau as well as its history are described.

Entomology

Science News-Letter, September 20, 1930

THE DIFFERENTIAL ANALYSIS OF STARCHES—James B. McNair—*Field Museum,* 44 p. Information in tabular and summary form regarding chemical and physical reactions of a large number of starches.

Chemistry

Science News-Letter, September 20, 1930

INSECTS: THEIR WAYS AND MEANS OF LIVING—Robert Evans Snodgrass—*Smithsonian Institution Series, Inc.,* 340 p. The author, a leading student of the biology of insects, has done a fine job that makes his book a worthy addition to the Smithsonian Scientific Series. With something over half of all known higher animals belonging to the insect subphylum, it would be an impossible task to tell their whole story in a single volume. Mr. Snodgrass knew much better than to try; he selected, and he selected exceedingly well. His sample insect families (grasshoppers and their relatives, termites, aphids, moths, a few diptera) find plenty of interesting problems in their lives, and his accounts of how they solve them are handled with a vigor and a lucid literateness that makes these many-legged little aliens seem near neighbors after all.

Entomology

Science News-Letter, September 20, 1930